Effect of Petroleum Price Increase on Cost of Selected Building Finishing Materials in the Nigerian Construction Industry (2006 - 2012)

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Abstract

It has been noted that a panacea to the problem of housing in Nigeria is the persistent increase in the prices of building materials. This in turn increases cost of construction due to increase in prices of petroleum products which results in variation and fluctuation of market prices of materials for construction projects. Finishings materials are exceptionally affected because they carry significant cost proportion of building projects. In view of this, the paper was aimed at examining the influence of petroleum price increase on the prices of some selected building finishing materials in Niger State from 2006 - 2012 in the light of high construction cost in the Nigerian Construction Industry. The data collected were based on three basic finishing materials, which are floor tiles, gloss/emulsion paints and ceiling boards, with different alternatives for each finishing material. Correlation and Regression Analyses used to analyze the collected data showed some level of high significance between the independent variable (regulated petroleum prices) and the dependent variables (finishing materials) i.e. Coefficient of Determination of values ranging from 61% to 90%. It was concluded that increase in the regulated price of petroleum products accounts for high cost of finishing materials in building projects. One of the recommendations from the study included the need for a better regulating price system to adequately monitor price with regard to building materials.

Keywords: building, civilian era, finishing materials, petroleum price,

1.0   INTRODUCTION AND BACKGROUND TO THE STUDY

Construction projects in Nigeria are prone to have an increase in price as a result of direct and indirect outcome of petroleum price increase to certain extent. Because the price of crude oil is dropping, the revenue of the country will also drop since it is the country's major revenue earner (Shittu et al., 2013(b)). The building materials market is exposed to constant changes in prices and some factors responsible for these are; port charges, inconsistent government policies, exchange rate, fluctuations, haulage costs, fall in value of naira, less inflow of foreign finance and cost of diesel.

The cost of delivery of construction materials will go up because of these; the operating cost of construction equipment like grader, excavator, bulldozer and the like will also increase. The cost of building materials such as cement, gravel, tiles, paint and the like will rise accordingly and this will automatically increase the cost of the whole building structure. Material costs comprise procurement of materials plus local and regional taxes, shipping and handling costs which consist of transportation, warehousing, and to some extent security. Some of these over heads are affected by cost of petroleum and may exceed the actual cost of material. This high cost of building materials have become a major pointer to the malfunction and abandonment of building construction projects in Nigeria today. This has resulted in severe consequences on the nation's socio-economic and technological development.

According to Dzukogi et al (2013) Nigeria has a population of over 160 million people and an abundance of natural resources especially hydrocarbons. Oil was discovered in Nigeria in 1956 at Oloibiri in the Niger-Delta after half a century of exploration. The discovery was made by Shell – BP. Nigeria joined the ranks of oil producers in 1958 when its first oil field came on stream producing 5, 100 barrel per day (bpd). Nigeria joined the Organization of Petroleum Exporting Countries (OPEC) in 1971 and established the Nigerian National Petroleum Corporation (NNPC) in 1997; as a state owned and controlled company and a major player in both the upstream and downstream sector. Nigeria has an estimated oil reserve of 22.5 billion barrels and produces 90 million tonnes per year from 2.6 million bpd of crude oil. Today, Nigeria is the 7th largest oil producer in the world.

Other aspects of the corporation's activities include transporting and distributing petroleum products throughout the nooks and crannies of the country and production of petrochemicals to provide the needed raw materials for rapid agricultural and industrial development of the country (Omozokpia, 2006; Dzukogi et al, 2013). The responsibilities also include the supervision of the activities of oil companies and services companies operating in the nation's petroleum industry (both foreign and indigenous), particularly those in which Government has participatory interest, and the statutory regulation of the nation's petroleum industry.

The refined product lines that are presently offered for sale to the public by Pipelines and Product Marketing Company Limited (PPMC), which is a subsidiary of NNPC, through the network of depots, are:

1) Liquefied Natural (Petroleum) - LNG - deregulated
2) Premium Motor Spirit - PMS - regulated
3) Dual Purpose Kerosene - DPK - regulated
   House Hold Kerosene - HHK - regulated
   Aviation Turbine Kerosene - ATK - regulated
4) Automotive Gas Oil - AGO - regulated
5) Fuel Oil
   i. Low Pour Fuel Oil - LPFO - effective 1st of July, 2002
   ii. High Pour Fuel Oil - HPFO

N.B: LPFO and HPFO do not attract bridging claims (which is the movement of petroleum product by road haulage from one depot district to another over and above distance of 450km).

Kaduna Refining and Petro-Chemical Company processes crude to produce non-conventional petroleum products like; a) Base oil b) Bitumen c) Asphalt d) Paraffin wax and Sulphur

There are two classes of marketers. First are the eight major marketers namely: Mobil Oil PLC, AGIP Oil PLC, Texaco PLC, A.P. PLC, Unipetrol PLC, National Oil PLC and Total/Elfina PLC. The second category on the other hand is made up of the indigenous business men and women that own outlets in both rural and urban areas in the country. The independent marketers provided a rapid increase in the number of filling stations in all corners of the country.

The method of petroleum products distribution is by Rail, Road, Sea and Pipelines. Bridging is the movement of petroleum products by road haulage from one depot district to another, over and above distances of 450km. The movement is an arrangement to complement movement of products through the pipeline during periods of breakdowns and/or maintenances of the pipeline network or Turn-Around maintenances of refineries. Bridging allowances are built into the petroleum pricing system so that Government will be able to implement the regulated pricing scheme.

According to Odularu (2008) crude oil discovery has had certain impacts on the Nigerian economy both positively and adversely. On the negative side, this can be considered with respect to the surrounding communities within which the oil wells are exploited. Some of these communities still suffer environmental degradation, which leads to deprivation of means of livelihood and other economic and social factors. Although large proceeds are obtained from the domestic sales and export of petroleum products, its effect on the growth of the Nigerian economy as regards returns and productivity is still questionable because crude oil revenue has not been properly used. Considering the fact that there are other sectors in the economy, the excess revenue made from the oil sector can be invested in them to diversify and also increase the total GDP of the economy.

Alley et al (2014) added that oil price shocks insignificantly retards economic growth while oil price itself significantly improves it. The significant positive effect of oil price on economic growth confirms the conventional wisdom that oil price increase is beneficial to oil-exporting country like Nigeria. Shocks however create uncertainty and undermine effective fiscal management of crude oil revenue; hence the negative effect of oil price shocks. Nigeria gained an extra US$390 billion in oil-related fiscal revenue over the period 1971 - 2005 (Budina and Wijnbergen, 2008 cited in Alley et al., 2014). Nigeria economically underperforms because her oil wealth has not been tapped to launch her onto economic heights; rather, she suffers from what can be described as a resource curse – a paradox of poverty amidst plenty resources.

Building materials refer to all or any material(s) used in construction such as brick, steel, cement, glass, aluminium, paint and tiles among others while components are products made as separate units to serve particular functions. They help to form or complete the building. Researchers in the construction field have shown that materials make up a very significant portion of the total cost of a building.

Olateju (1991) and Jagboro (1992) asserted that material occupies above 60% of the total cost of construction. Jagboro (1992) re-emphasized that all building materials used do not have the same significance on the cost of the building and also do not have the same relative importance on the existence of the building. Onibokun & Agboola (1990) classified building materials into six broad categories on conventional construction method. These include: flooring materials, walling materials, ventilation materials, roofing/ceiling materials, painting materials and sanitary wares.

Okafor (2003) classified construction cost into direct cost and indirect cost. Directs costs are predominantly the cost of all plant equipment as well as materials and labour involved in the actual installation and erection while indirect costs include transportation cost among others. Cost of transportation is defined as the cost incurred in moving persons or commodities over distances. This cost of transportation includes the freight rate but also cost of documentation, packaging, insurances and inventory cost. The costs may be expressed in terms of transport effort like the tonne or kilometer or in monetary form and the most important consideration in transportation are cost of carriage, speed of carriage and quantity of load factor.

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The Nigerian oil boom of the early 70s coincided with the after war construction and rehabilitation period in the country created very heavy task. Therefore, in order to meet up with the human, technological and material resources required to undertake the huge construction activities going on at the time, there was recourse to importation. This looked alright then, especially since the oil provided the much required financial backing. This however was however short-lived as oil revenue crashed in the early 80s. Faced with the depressed economy and a crushing foreign department, the nation witnessed introduction of the Structural Adjustment Programme (SAP) in 1986 and consequent devaluation of Naira.

Consequently, there was the need for Nigeria to be a self-reliant nation. As a result, a call to harness local resources in all sections of the economy, including the construction sector became necessary. The local building materials have been discovered to possess great potentials for transforming the Nigerian construction industry. The need for importation of building materials also stifled local initiative in the production and utilization of local materials and technologies. The indigenous contractors that sprang up during the oil boom controlled only 50% of the construction activities, consequently most of them folded up (Encyclopedia Americana, 1981). The important trend has failed the nation towards enjoying economic growth and employment opportunities commensurate with huge financial investments on the channel to the construction industry.

Owing to the discovery from many researchers, it has been noted that high construction cost has become a major problem in the Nigerian construction industry today. For instance, Shittu et al. (2013a) reported that a panacea to the problem of housing in Nigeria is the persistent increase in the prices of building materials which in turn increases cost of construction. All construction projects have increased in cost due to increase in prices of petroleum products which results in variation and fluctuation of market prices of materials for construction projects. This paper is the second phase of an ongoing research. The first phase studied the impact of petroleum price increase on the cost of building finishing materials during the early period of the new millennium democratic dispensation (Shittu et al., 2013b) while the third phase will compare the research findings of the first phase and second phase. This study is therefore necessary, in view of the identified problems, to form a good basis for investigating the impact of petroleum price increase on the cost of building finishing materials between 2006 and 2012 (transition in to more advanced level of democratic dispensation) thereby enabling the contractors and clients have fair judgment in terms of claims by assisting to develop a cost guide for pricing building construction works and cost analysis of building works in Niger State, Nigeria.

In view of the identified problems, this paper focuses at examining the effect of increase in price of petroleum products on the prices of some selected building finishing materials in Niger State between 2006 and 2012 with a view to enhancing project delivery by government and stakeholders in the construction industry.

The finishing materials covered for the study are China Vitrified Tiles (30x30cm), Royal Ceramic Tiles (30x30cm) and Abeokuta Tiles, as the floor finishing materials; the ceiling finishing materials are Asbestos (4inch x 4inch) ceiling board and polyvinyl Chloride (PVC) ceiling Board; and the wall finishing materials covered are Emulsion (20ltr) and Gloss (4ltr) paints of Sandtex and Vinyl products each. The petroleum product considered for the study is Premium Motor Spirit (PMS) popularly known as petrol which is the most widely used petroleum product in Nigeria.

2.0 METHODOLOGY AND DATA COLLECTION

One of the methods of survey employed in this study is the random sampling technique in getting pertinent information in the location. This was done by sending out questionnaires to shops dealing with building materials to collect the data in conjunction with direct observation. Data on prices of petroleum products were gathered from Mobil Petroleum (independent marketer).

Analysis of data was done using both descriptive and inferential statistical methods. The use of bar and line graphs were used to compare trends between the building materials and price of petroleum for the descriptive analysis. For the inferential analysis, the relationship between the variables in the data collected was determined using correlation and simple regression analysis, the correlation coefficient (R), coefficient of determination (R^2) and the tests of significance (F-test and P -test). The correlation analysis was used to determine the degree of association between the variables tested and regression analysis was used to formulate predictive models of the variables simultaneously observed in relation to one another.

Basically, the following null hypothesis was tested at 95% confidence level in order to promote the achievement of the objectives of the study:

H_o: There is no significant relationship between the prices of petroleum products and prices of the selected building finishing materials of building.

H_1: There is significant relationship between the prices of petroleum products and prices of the selected building finishing materials of building.

All other factors, some of which are mentioned in the background to the study, like exchange rate, inflation and demand and supply forces which could lead to increase in price of building materials are assumed

to remain constant in this study.

The research data collected from the independent marketer and authors' field survey are presented in TABLE 1.

TABLE 1: Data Collected on Regulated Price of Petrol and Price of Selected Building Materials from 2006 to 2012

Year Petrol/Materials	2006	2007	2008	2009	2010	2011	2012
Petroleum Per Litre (=N=)	70	75	90	70	90	90	138
Abeokuta Tiles (=N=)	3500	4000	4500	5000	5500	6000	6500
China floor tiles (=N=)	850	950	1050	1050	1150	1150	1250
Royal tiles	500	600	800	850	950	1100	1100
PVC Ceiling per sq metre (=N=)	900	900	850	800	700	700	750
Asbestos ceiling per sheet (=N=)	500	600	650	700	750	750	800
Sandtex gloss paint (=N=)	2000	2500	2800	2945	3000	3200	3520
Sandtex emulsion paint (=N=)	1800	2000	2500	2600	2500	2800	3000
Vinyl matt (=N=)	1000	1200	1250	1350	1400	1580	1740
Vinyl emulsion (=N=)	950	1000	1200	1200	1300	1500	1650

SOURCE: i. Mobil Petroleum Marketer (Minna)

ii. Market Survey (Researchers' Field work, 2013)

3.0 RESULTS AND DISCUSSIONS

3.1 Results of Descriptive Analysis

It was discovered from the descriptive analysis that the prices of all building materials selected respectively followed similar trend with that of petrol except the price of PVC Ceiling, which moves in opposite direction to the price of petrol. This is in line with the findings of Omozokpia (2006) who studied the effect of the increase of the price of petrol on the prices of building finishing materials from 2000 to 2005. The graphs showing these trends are presented Figures 1 to 9.
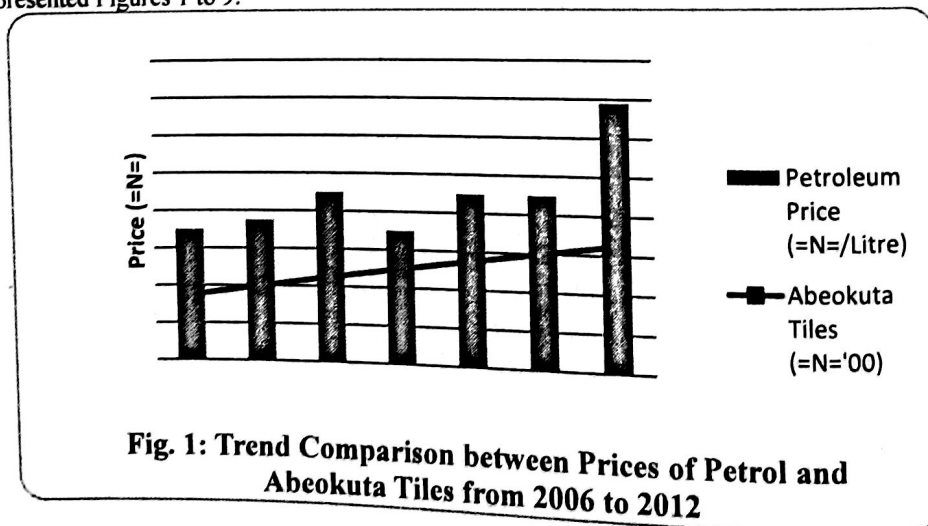

Fig. 1: Trend Comparison between Prices of Petrol and Abeokuta Tiles from 2006 to 2012
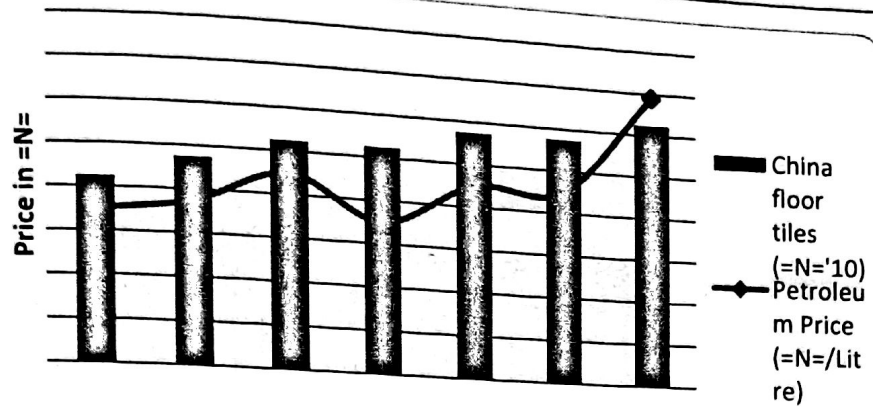
Fig. 2: Trend Comparison between Prices of Petrol and China Floor Tiles from 2006 to 2012
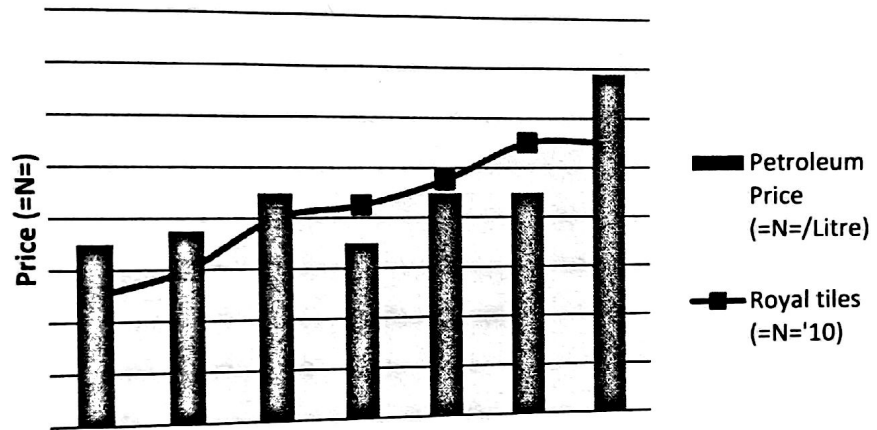

Fig. 3: Trend Comparison between Prices of Petrol and Royal Tiles from 2006 to 2012
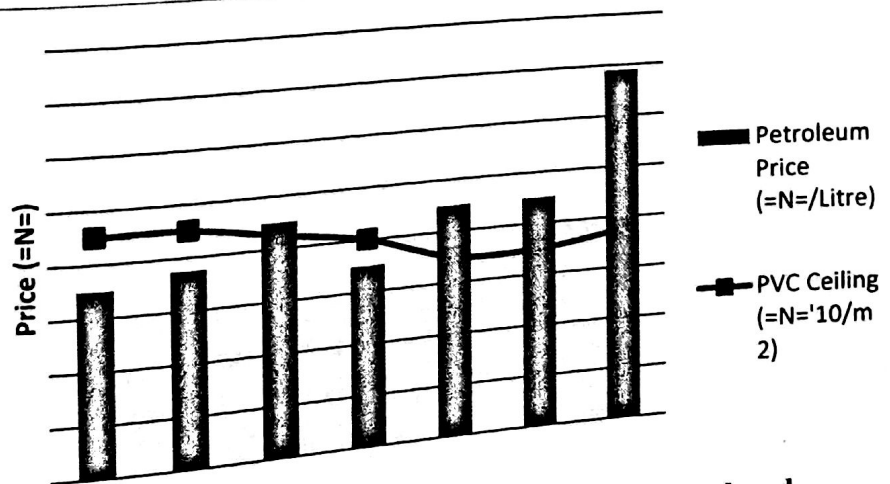

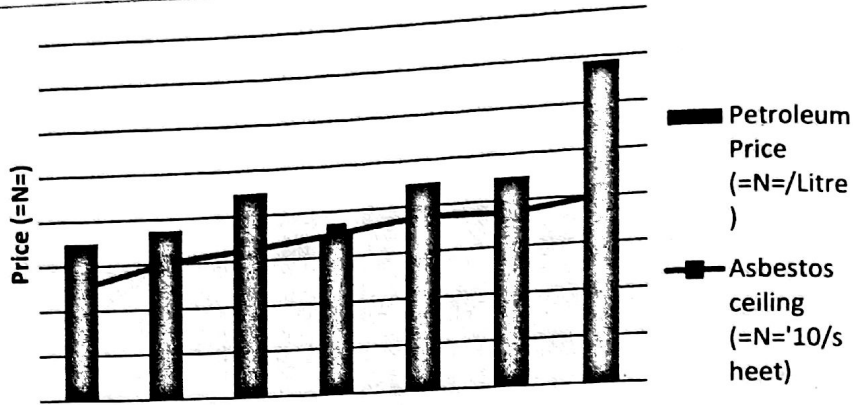**Fig. 4: Trend Comparison between Prices of Petrol and PVC Ceiling from 2006 to 2012**

Fig. 5: Trend Comparison between Prices of petrol and Asbestos Ceiling from 2006 to 2012
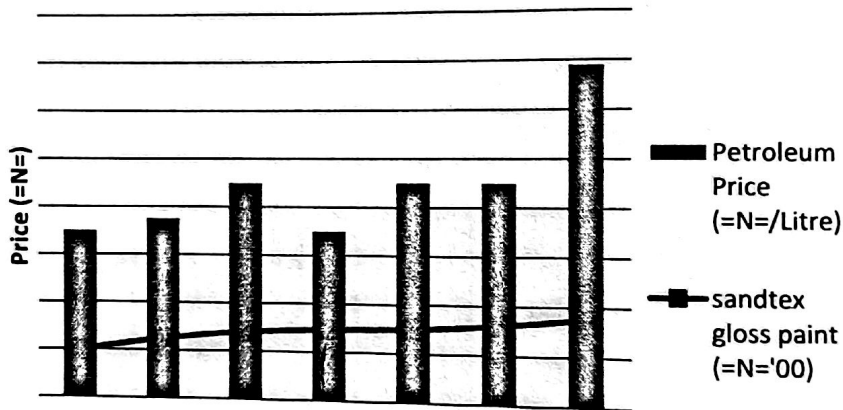
Fig. 6: Trend Comparison between Prices of Petrol and Sandtex Gloss Paint from 2006 to 2012
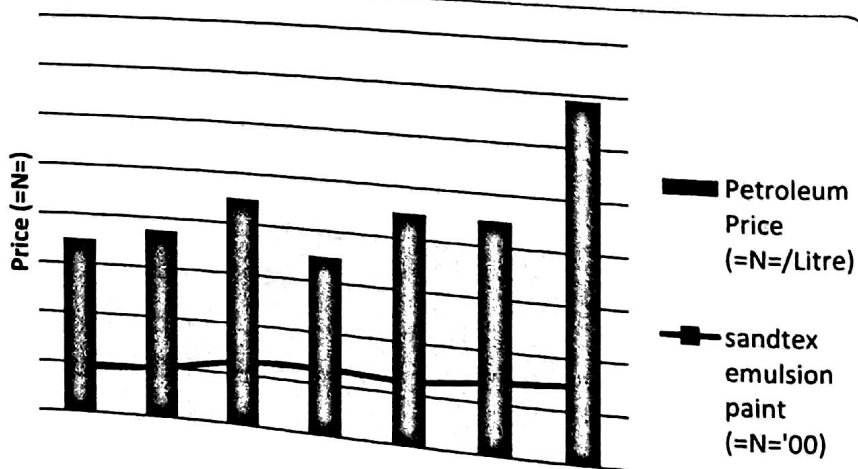
Fig. 7: Trend Comparison between Prices of Petrol and Sandtex Emulsion Paint from 2006 to 2012
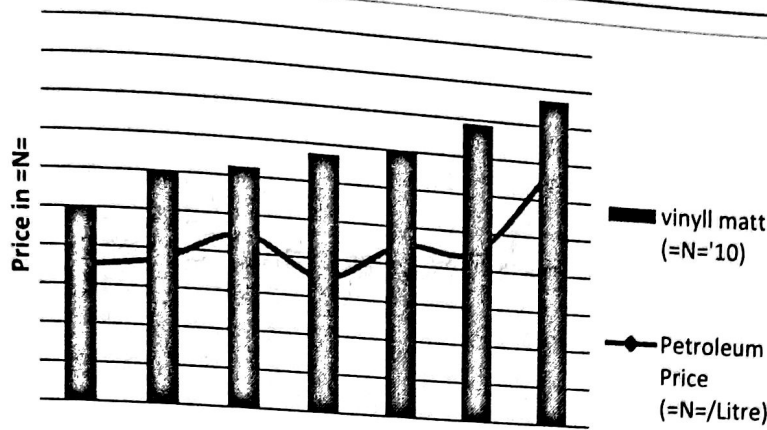
Fig. 8: Trend Comparison between Prices of Petrol and Vinyl Matt Paint from 2006 to 2012
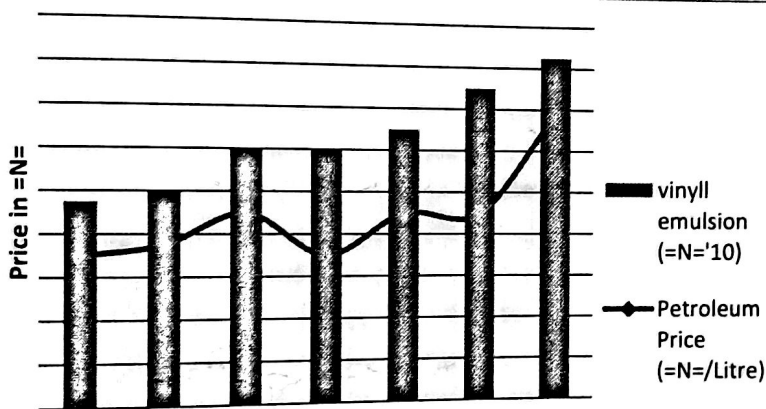

Fig. 9: Trend Comparison between Prices of Petrol and Vinyl Emulsion Paint from 2006 to 2012

3.2 Results of Inferential Analysis

The first set of analyses (Analyses 1a, 1b and 1c) were carried out to test the relationship between price of each of the three floor finishing materials (i.e. Abeokuta tiles, China vitrified tiles and Royal ceramic tiles) and the regulated price of petroleum products. The coefficients of correlation (R) and determination (R^2) observed respectively were 57% and 32% for Abeokuta Floor tiles versus Price of petroleum products; 65% and 42% for China vitrified floor tiles versus price of petroleum products; and 58% and 33% for Royal ceramic floor tiles versus price of petroleum products respectively. This implies that the relationship between each of the three floor finishing materials and price of petroleum products was positive, linear and significant in degree of association. Therefore, increase in the prices of floor finishings is accounted for as a result of increase in the price of petroleum products and vice-versa. The values of F calculated observed respectively were 12.241, 18.755 and 12.988 which were greater than the value of F tabulated of 4.41 while the P value (0.000) in each of the three cases was less than 0.05. This implies that there exists a significant relationship between the variables and the null hypothesis was therefore rejected in each of the three cases.

The relationship between the prices of each of the two ceiling finishings materials selected for this study (i.e. PVC Ceiling Board and 4" x 4" asbestos ceiling board) and regulated price of petroleum products was determined in the second analysis. It was observed that there exists a weak, negative and non-significant relationship between the price of PVC Ceiling Board and regulated price of petroleum products. The coefficient of determination (R^2) value observed was 12% implying weak relationship and the correlation coefficient (R)

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observed was 34%/0.34 indicating weak degree of association between the variables. The negative correlation observed between the variables indicates a tendency for increase in the price of petrol to be followed by a decrease in the price of PVC Ceiling and vice versa. The value of F calculated of 3.419 observed was less than the value of F tabulated of 4.41 while the probability (P) value of 0.076 observed was greater than 0.05. This led to the acceptance of the null hypothesis in this case of PVC ceiling board versus regulated price of petroleum products. In the case of asbestos ceiling board and regulated price of petroleum products, on the other hand, it was observed that there exists a weak, positive and significant relationship with strong degree of association between the variables. The coefficient of determination (R^2) value observed was 33% implying a weak relationship and the correlation coefficient (R) observed was 58%/0.58 indicating a strong degree of association between the variables. The positive correlation observed between the variables indicates a tendency that an increase in the price of petrol will be followed by an increase in the price of asbestos ceiling and vice versa. The value of F calculated of 12.87 observed was greater than the value of F tabulated of 4.41 while the probability (P) value of 0.001 observed was less than 0.05. This led to the rejection of the null hypothesis in this case.

It was observed from the third analysis that there exists a positive, linear, weak and significant relationship but strong degree of association between each of the selected painting materials of Sandtex products (i.e. Sandtex gloss paint and Sandtex emulsion paint) selected for the study and price of petroleum products. R and R^2 values of 59% and 35%; and 56% and 32% respectively were observed in each of the two cases respectively. The respective values of F calculated were 14.10 and 12.073 which were each greater than F tabulated value of 4.41, while the P value of 0.001 and 0.002 observed in each of the two cases respectively was less than 0.05 and this also led to the rejection of the null hypothesis in this analysis.

The fourth analysis showed a positive, linear, strong and significant relationship between the independent variable (regulated price of petroleum products) and the dependent variable (Vinyl Matt paint). The correlation coefficient observed was 73%, while the coefficient of determination observed was 53%. The null hypothesis was therefore rejected in this analysis because the F calculated value was greater than the F tabulated value and the P value was less than 0.05. The result of the analysis between price of Vinyl emulsion paint and price of petrol, on the other hand, showed that there exists a weak, positive and significant relationship between the variables. The coefficient of determination (R^2) value observed was 32% implying a weak relationship and the correlation coefficient (R) observed was 56%/0.56 indicating a strong degree of association between the variables. The positive correlation observed between the variables indicates a tendency that an increase in the price of petrol will be followed by an increase in the price of Sandtex Emulsion Paint and vice versa. The value of F calculated of 12.073 observed was greater than the value of F tabulated of 4.41 while the probability (P) value of 0.002 observed was less than 0.05. This also led to the rejection of the null hypothesis in this case.

The results of the regression analyses discussed above, as well as the regression equations used to formulate a predictive model for the study, are summarized in Table 2.

Table 2: Results Summary for Inferential Analysis

| Analysis No. | Variables | | Type of Model | Observations | | | | | Inferences | | |
	X	Y		Regression Equation	R/R² (%)	F_{cal}	F_{tab}	P_{value}	Strength of Relationship	Remark	Action On Hypothesis
1a	Petrol	Abeokuta Tiles	Linear	Y = 2427.38 + 28.62x	57/32	12.241	4.41	0.020	Weak	SS	Reject Ho
1b	Petrol	China Floor Tiles	Linear	Y = 644.67 + 4.73x	65/42	18.755	4.41	0.000	Weak	SS	Reject Ho
1c	Petrol	Royal Tiles	Linear	Y = 205.24 + 7.24x	58/33	12.988	4.41	0.001	Weak	SS	Reject Ho
2a	Petrol	PVC Ceiling	Linear	Y = 948.83 − 1.67x	34/12	3.419	4.41	0.076	Weak	NS	Accept Ho
2b	Petrol	Asbestos Ceiling	Linear	Y = 380.01 + 3.37x	58/33	12.87	4.41	0.001	Weak	SS	Reject Ho
3a	Petrol	Sandtex Gloss Paint	Linear	Y = 1458.76 + 15.99x	59/35	14.1	4.41	0.001	Weak	SS	Reject Ho
3b	Petrol	Sandtex Emulsion Paint	Linear	Y = 1361.58 + 12.73x	56/32	12.073	4.41	0.002	Weak	SS	Reject Ho
4a	Petrol	Vinyl Mat Paint	Linear	Y = 473.95 + 9.79x	73/53	29.279	4.41	0.000	Strong	SS	Reject Ho
4b	Petrol	Vinyl Emulsion Paint	Linear	Y = 414.41 + 9.43x	67/46	21.671	4.41	0.000	Weak	SS	Reject Ho

Source: Authors' Data Analysis (2013)
Key:
SS = Statistically Significant
NS = Not Significant
Petrol   =   Regulated Price of Petroleum Products

4.0 FORMULATION OF A PREDICTIVE MODEL

From the Regression Analyses carried out, nine (9) models have been formulated out of which only (1) has not been found suitable which PVC ceiling board is. Out of the eight (8) suitable models discovered based on the significant relationship they showed in the analysis, only one (1) has been found to be the most suitable of the whole models formulated based on the fact that it has the respective correlation and determination coefficients to be strong and this was Vinyl Matt Paint. The formulated models are summarized in Table 3.

Table 3: Summary of Predictive Models

Analysis No.	Model/Equation	Suitability
1	$AbeokutaTiles = 2427.38 + 28.62Petrol$	Suitable
2	$ChinaFloorTiles = 644.67 + 4.73Petrol$	Suitable
3	$RoyalTiles = 205.24 + 7.24Petrol$	Suitable
4	$PVCCeiling = 948.83 - 1.67Petrol$	Not Suitable
5	$AsbestosCeiling = 380.01 + 3.37Petrol$	Suitable
6	$SandtexGlossPaint = 1458.76 + 15.99Petrol$	Suitable
7	$SandtexEmulsionPaint = 1361.58 + 12.73Petrol$	Suitable
8	$VinylMattPaint = 473.95 + 9.79Petrol$	Very Suitable
9	$VinylEmulsionPaint = 414.41 + 9.43Petrol$	Suitable

Source: Authors' Data Analysis (2013)

5.0 CONCLUSIONS

This study has shown through analysis of data collected that trends on the prices of finishing materials and regulated prices of petroleum products over the period under review, concludes as follows:

1 Increase in the regul
2 ated price of petroleum products accounts for high cost of finishing materials in building projects.
2 Prices of all building materials selected respectively followed similar trend pattern with that of petrol except the prices of PVC Ceiling, which moves in opposite direction to the price of petrol.
3 It was discovered from the inferential analysis that the price of all the building materials selected correlated positively and strongly with the price of petrol with coefficient of correlation (R) value ranging from 50 – 73% except PVC Ceiling Board.
4 All selected building materials prices had significant relationship with the price of petrol respectively except the prices of PVC. This shows that the price of petrol can serve as a good predictor of the prices of building materials and vice versa at 95% confidence level.
5 Only (1) model has not been found suitable which was that of PVC Ceiling Board was, out of the nine (9) models which were formulated.
6 It can therefore be concluded finally that the formulated models can be used for forecast at 95% confidence limit.

6.0 RECOMMENDATIONS

1 The Federal Government should embark on regulated price of building materials at fixed price especially for those foreign materials like China tiles since there is increase in price of finishing materials due to in price of petroleum products.
2 More quality input should be encouraged in locally processed building materials so that they have long life span and can be recommended to all construction projects, like the use of Abeokuta tiles, Royal tiles and asbestos ceiling board.
3 The predictive models should be reviewed at regular intervals in the light of changing environmental circumstances by any user of the model for the model to stand the test of time.
4 Further research should be undertaken for study the effect of price of petrol on the cost of other important building materials apart from finishings materials.
5 A further research to cover about 30 years in selected States in the six geo-political zones of Nigeria is also recommended.

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